Prognosis for Patients Treated Conservatively for Spontaneous Intracerebral Hematomas

SUSANNE HELWEG-LARSEN, M.D., WINNIE SOMMER, M.D., PALLE STRANGE, M.D., JACK LESTER, M.D., AND GUDRUN BOYSEN, M.D.

SUMMARY The long-term clinical and CT-outcome of 53 conservatively treated patients with spontaneous intracerebral hematomas (ICH) was studied in relation to the acute findings.

The acute mortality of ICH was 27%. Determinant for the immediate prognosis was the level of consciousness and the volume of the hematoma. The crucial size was 50 ml with a mortality of 90% for hematomas larger and 10% for hematomas smaller than that. Intraventricular hemorrhage was a bad prognostic sign only in the ganglionic-thalamic hematomas.

At follow-up at a median of 4½ years after ICH, 30% of the total series had a completely normal neurological examination and 28% had resumed work. Thirteen per cent had minor neurological deficits and 17% had debilitating sequelae. During the follow-up period 7 patients had died, which indicates an excess mortality for ICH survivors.

The CT findings at follow-up consisted of low density areas smaller than the original hematomas, focal atrophy, calcifications and porencephalic cysts. In 10% the CT scan revealed no trace of the previous hematoma.

Before the advent of cranial computer tomography (CT) the acute mortality of intracerebral hematomas (ICH) varied from 51% to 92%. The long-term prognosis was evaluated in surprisingly few studies. Six months after ICH McKissock et al. of a total of 91 patients found that 51% were dead, 12% had returned to full work, 22% were partially disabled and 15% were totally disabled. Out of 138 patients who had survived ICH Felger et al. after an observation period of 3 to 7 years found that 35% had died, 14% had recovered completely and 43% and 8% respectively were partially and totally disabled.

After CT has become available the diagnosis of ICH is made more frequently and with greater accuracy. As a probable effect of diagnosing smaller hematomas the overall acute mortality of ICH has declined to about 30%. The resolution of the hematomas as visualized by CT during the first weeks and months has been described in several studies. The long-term outcome after 6-29 months of CT verified ICH has been evaluated in clinical studies, which however, did not include concomitant follow-up CT studies.

The purpose of the present paper was to study the long-term clinical and CT outcome of conservatively treated spontaneous ICH as related to the acute findings.

Patients and Methods

This series of CT-verified ICH was collected from the neurological and neurosurgical departments at Rigshospitalet, Denmark, over the years 1974 to 1982. The clinical data concerning the acute phase were compiled retrospectively from the charts. After exclusion of patients with ICH known to be due to trauma, ruptured arterial aneurysm and to hemorrhage into tumors a total of 108 patients were diagnosed as having a spontaneous ICH. Neurosurgical evacuation of the hematoma was performed in 55 patients. The remaining 53 patients who were conservatively treated for spontaneous ICH formed the object of the present study.

The material is not representative of the true population of patients with ICH since selection for CT examination did take place favouring patients of younger age groups; geriatric patients already comatose on admission may not have been considered for a CT.

At the time of admission the age of the patients varied from 10 to 79 years (median 54 years). There were 30 men and 23 women.

Fourteen patients (27%) died from 0–16 days after onset of ICH. Autopsy was performed in 11 of these and confirmed the diagnosis in all cases. Seven patients died during the follow-up period from 7–62 months after the ICH, one of these from recurrent ICH and one from an unspecified cerebrovascular incident according to the death certificate.

The surviving 32 patients (15 F and 17 M) were offered a follow-up neurological examination and CT study during the spring of 1983. None of these had experienced recurrence of ICH. The follow-up examination was performed in 29 patients. In 3 patients the information on their clinical and social status was obtained from their general physician. These 3 patients were severely hemiplegic and 2 of them aphasic as well, and all lived in nursing homes.

During the first 3 years the CT studies were performed on an EMI-Mark I-scanner and thereafter on an EMI 1010-scanner, and both produced 160 × 160 matrix images. On follow-up examination all CT scans were done without contrast material, since we did not expect to find abnormal contrast enhancement after an interval of more than one year. The initial CT was performed at a median of 2 days (range 2 hours to 42
days), after the onset of symptoms. The follow-up scan in the 29 patients was done at a median of 54 months (range 15 to 103 months) after onset.

Based on the initial CT studies the hematomas were divided into the following groups according to the location of the largest blood-clot: 1) Lobar hematomas (frontal, parietal, temporal, occipital), 2) ganglionic-thalamic hematomas (caudate, putaminal and thalamic), and 3) hematomas in the posterior fossa (pontine and cerebellar). Each group was subdivided into two, with or without intraventricular hemorrhage (IVH).

The volume of the hematoma was estimated by measuring the volume of the high-absorption lesion (length × width × cut thickness) in each slice showing blood. The total volume being found by adding these volumes.

As a measure of the immediate prognosis the patients were restrospectively given an initial score after a modified Oxbury scale in which age was given a maximum of 8 points, level of consciousness maximally 18 points, external ocular movements maximally 4 points and limb movements maximally 12 points, giving a total of 42 points. In order to compare the neurological findings at the times of admission, discharge and follow-up the following score was used: Orientation as to time, place and person maximally 18 points, aphasia maximally 8 points, facial palsy maximally 4 points, visual fields maximally 2 points, limb movements maximally 12 points, giving a total of 44 points.

The medical treatment depended on the clinical condition of the individual patient. It consisted of antihypertensive and antiepileptic treatment, electrolyte and fluid replacement, hyperventilation and steroids in selected cases, and analgesics. Physical rehabilitation was carried out in the majority of the patients. Speech therapy was given, when aphasia was present.

Results

The predisposing factors to ICH were hypertension, treatment with anticoagulants, arteriovenous malformation and alcoholism (table 1). In 47% no predisposing factors were identified.

The ICHs were located in the hemisphere lobes in 29 patients (4 frontal, 2 parietal, 14 temporal, and 9 occipital), in the ganglionic-thalamic area in 19 patients (4 frontal, 2 parietal, 14 temporal, and 9 occipital), and in the posterior fossa in 5 patients (1 pontine and 4 cerebellar) (table 1). Rupture of the hematoma into the ventricular system was found in 10 of the lobar hematomas, in 9 of the ganglionic-thalamic hematomas and in 2 posterior fossa hematomas. In lobar hematomas the acute mortality was 21% without intraventricular hemorrhage (IVH), 30% with IVH, and there was no difference in the volume of the hematomas in the two groups. In contrast, in the ganglionic-thalamic hematomas there were no fatalities among 10 patients without IVH, while the acute mortality was 56% in patients with IVH, but in this group of patients those with IVH had larger hematomas than those without.

The volume of the hematoma was determinant for the immediate prognosis (table 2). In non-survivors the median of the hematomas measured 93 ml (16-235) and in survivors 23 ml (3-85), p < 0.01 (Wilcoxon rank sum). The crucial size was 50 ml with a mortality of 90% for hematomas larger and 10% for hematomas smaller than that. One patient survived a hematoma of 85 ml, this patient, however, died during the follow-up period. The mass effect of the hematoma likewise influenced the mortality and no-one survived a midline shift of more than 15 mm. Age was not significantly related to mortality and the volume of the hematoma was not significantly correlated to age.

The clinical findings with the most significant bearing on the prognosis was the level of consciousness and gaze palsy. In the group of patients with initial scores of 0-16 points the acute mortality was 80%, while the mortality was only 12% in the group with the best initial score (26-42 points).

The 29 patients who participated in the follow-up study had neurological scores at admission of a median of 30 points (2-44), at discharge of 38 points (26-44) and at follow-up examination a median of 44 points (30-44). Among these 29 patients, 16 had a completely normal neurological examination at follow-up, 6 had debilitating sequelae and 7 had minor neurological sequelae. Twenty–seven lived in their own homes and 2 in special flats for handicapped. Before the ICH 17 patients had been fully employed, 5 were housewives, 5 were on disability pension and 2 were receiving old-age pension. At the follow-up 10 patients had returned to their original job, 2 of these, however, on reduced working hours, 5 were housewives — four with reduced and one with the same working capacity as earlier — 11 patients were on disability pension and 3 were receiving old-age pension.

The neurological score at follow-up examination is

### Table 1: Predisposing Factors and Location of Intracerebral Hematoma

<table>
<thead>
<tr>
<th></th>
<th>Lobar</th>
<th>Ganglionic-thalamic</th>
<th>Posterior fossa</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension*</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Treatment with anticoagulant</td>
<td>7</td>
<td>0</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>A-V malformation</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Alcoholism</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Idiopathic</td>
<td>12</td>
<td>10</td>
<td>3</td>
<td>25</td>
</tr>
</tbody>
</table>

*Three of these patients were alcoholics.

### Table 2: Volume of the Hematomas and the Occurrence of Intraventricular Hemorrhage (IVH) and Midline Shift Versus Acute Outcome

<table>
<thead>
<tr>
<th>Volume of hematoma</th>
<th>No. of patients</th>
<th>IVH</th>
<th>Shift</th>
<th>Dead in acute stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-10 ml</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11-50 ml</td>
<td>32</td>
<td>12</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>More than 50 ml</td>
<td>11</td>
<td>6</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>21</td>
<td>24</td>
<td>14</td>
</tr>
</tbody>
</table>
related to the localization of the hematoma in figure 1. The poorest prognosis was in patients with ganglionic-thalamic hematomas, and there were no differences in the prognosis, whether the bleeding was putaminal, caudate or thalamic. There was no correlation between the clinical neurological recovery and the initial size of the hematoma as long as this was smaller than 50 ml (table 3).

CT sequelae of the hematomas are given in table 4. The most frequent finding was a combination of a low density lesion and a dilatation of the adjacent lateral ventricle (focal atrophy). Porencephaly seemed to result from the largest hematomas and calcification and normal CT from the smallest hematomas. All the low density areas were smaller than the original hematomas. In 2 patients the only trace of the previous ICH were small areas of calcification. Three patients had normal CT scans. These 5 patients had a normal neurological examination at follow-up. In the description of the CT findings we did not consider diffuse central or cortical atrophy since these changes did not necessarily represent sequelae of the hematoma.

The seasonal distribution of the occurrence of ICH was the following: 7 cases occurred in the winter, 8 in the spring, 22 in the summer and 16 in the fall.

**Discussion**

Survival after ICH with complete restitution of neurological function and with apparently normal intellectual function was seen in 30% of the total series or in 41% of the survivors of the acute stage of ICH. During the follow-up period 18% had died rendering the mortality for ICH survivors far greater than that of an age-matched normal population. The number of patients, however, was too small to permit calculation of the death risk. Of the total patient population in this study 13% survived with minor neurological deficits, 17% with debilitating sequelae. This clinical outcome is more benign than that found in earlier series and this may be a natural consequence of diagnosing clinically less severe cases with smaller hematomas. It corresponds to recently published series.

Rupture of the hematoma into the ventricular system has been associated with an increase of the acute mortality in some studies, while others found that IVH did not influence the prognosis. In the present study we found that IVH increased the acute mortality only in the ganglionic-thalamic hematomas, as previously described by Weisberg but these hematomas were also the largest.

There seems to be no general agreement on what method to use in calculation of the volume of the hematoma which makes comparisons between studies difficult. In some studies the largest diameter or the largest area of the hematoma has been given. Common to all studies is that the prognosis is worse the larger the hematoma. In agreement with the study of Kase et al we found 50 ml to be the critical size. It is noteworthy that the clinical outcome may be predicted from the clinical examination with almost equal accuracy as from the volume of the hematoma seen on the CT scan. Like Oxbury et al we found that patients with a combination of decreased level of consciousness and gaze palsy had a poor prognosis.

The follow-up CT scan revealed traces of the previous ICH in 90% of the patients. The changes consisted of low density areas, often slit-like, with or without focal atrophy, calcification or porencephaly. These findings agree with previous descriptions in which the maximal observation period ranged from 3 months to 2 years as contrasted to 1 to 8 years (median 4½ years) in the present series (table 4). It may therefore be assumed that the chronic CT changes stay fairly constant.

**Table 3 Volume of the Hematomas Versus Neurological Score at Follow-up in 29 Patients**

<table>
<thead>
<tr>
<th>Volume of hematoma</th>
<th>Neurological scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>No.</td>
</tr>
<tr>
<td>3-10 ml</td>
<td>0</td>
</tr>
<tr>
<td>11-30 ml</td>
<td>1</td>
</tr>
<tr>
<td>31-50 ml</td>
<td>0</td>
</tr>
</tbody>
</table>

(1): Patients with intraventricular hemorrhage (IVH). Neurological scores: modified Oxbury-scale, see text.

**Table 4 CT Sequelae of the Intracerebral Hematomas after a Median of 4½ Years in 29 Patients**

<table>
<thead>
<tr>
<th>CT findings</th>
<th>No. of patients</th>
<th>Average volume of hematomas (ml)</th>
<th>Average neurological score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low density lesion</td>
<td>6</td>
<td>20</td>
<td>43</td>
</tr>
<tr>
<td>Focal atrophy</td>
<td>6</td>
<td>19</td>
<td>39</td>
</tr>
<tr>
<td>Low density lesion and focal atrophy</td>
<td>9</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>Porencephaly</td>
<td>3</td>
<td>28</td>
<td>41</td>
</tr>
<tr>
<td>Calcification</td>
<td>2</td>
<td>12</td>
<td>44</td>
</tr>
<tr>
<td>Normal CT scan</td>
<td>3</td>
<td>16</td>
<td>43</td>
</tr>
</tbody>
</table>
stable beyond 6–12 months. This would be in agreement with the neuropathological studies.25 It is noteworthy that the CT scan will return to normal in about 10%.

In Minnesota, Ramirez-Lassepas26 found a seasonal variation of ICH with highest incidence during the winter months. In this Danish material we found the highest incidence during the summer months and are inclined to believe that these variations probably are fortuitous.

Conclusions
The long-term prognosis for patients with ICH was more benign than previously described with 30% without neurological deficits after 4½ years. The long-term outcome was worse for patients with ganglionic-thalamic than for those with lobar hematomas. The volume of the hematoma was determinant for the immediate prognosis with a critical size of 50 ml.

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*Stroke*. 1984;15:1045-1048
doi: 10.1161/01.STR.15.6.1045
*Stroke* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0039-2499. Online ISSN: 1524-4628

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